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A CASE OF GENUA VALGA, WITH REMARKS ON OSTEOTOMY

BY

CHARLES GREENE CUMSTON, M.D.

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A CASE OF GENUA VALGA, WITH REMARKS ON OSTEOTOMY.*

By CHARLES GREENE CUMSTON, M.D.,

Assistant Professor of Surgical Pathology, in the Faculty of Medicine of Tufts College, Boston.

THIS young girl is seventeen years old, and has been employed in a rubber factory for the past two years, her occupation obliging her to be on her feet the greater part of the time. She is anemic, and not well nourished, as you see. Her family and personal history give us no particular indications as to the affection for which she comes to obtain relief.

The patient says that for about two years her knees have given her trouble, from the fact that they bend inwardly, and that after walking considerable pain is felt. Inspection of the limbs immediately reveals a typical genua valga, but the same pathological condition does not exist in each limb, for by closer examination you will observe that on the right the deformity is due to an hypertrophy of the internal condyle of the femur, while on the left there is an hypertrophy of the internal condyle of the tibia.

This afternoon I shall operate on this girl, in order to restore the normal shape, and consequently the proper functions of the limbs. On the femur, an osteotomy by McEwen's method will be done, while a wedge-shaped osteotomy will be done on the tibia of the left leg. Now, in order that

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you may understand the steps and indications for osteotomy, I beg to say a few words regarding this operation, and those affections calling for this treatment.

Osteotomy was not often undertaken by the older surgeons, on account of the disastrous results following infection of their wounds, although the operation was performed as early as 1826 by Rhea Barton. Finally after the introduction of aseptic surgery, the operation again came into favor, and in 1884 McEwen, of Glasgow, published statistics of eighteen hundred cases of osteotomy, with only five deaths, all being due to specific disease, such as diphtheria, pneumonia and phthisis.

The operation of osteotomy, as performed to-day, offers but little danger, the only untoward complication that can arise being fat embolus and infection of the wound. When the bone is separated by the incision, tiny drops of bone marrow sometimes enter the lumen of the veins divided in the operation, and are carried along in the circulation to the right heart, and from there they enter the lungs by the arterial circulation, and block up the capillaries. If the amount of fat globules be in any quantity, the lungs will be pretty well filled, and death takes place from paralysis of the respiration. The use of Esmarch's band, I believe to be responsible for fat embolus in many instances, and I always endeavor to do without artificial anemia in bone operations, for this reason.

With all the recent progress made in surgery, the technic of osteotomy has been improved and considerably simplified. In the older operations, the bone was exposed by a lengthy longitudinal incision, or by a flap, and was then sawed. Another technic, advocated by von Langenbeck, was a small, cutaneous incision, the bone being cut without being exposed. This is called sub-cutaneous osteotomy.

In sub-cutaneous osteotomy, a small incision is made in the integuments, and with a drill a passage is made through the middle of the bone. A chain saw is next passed through the drill hole, and the bone is sawn, first on one side and then on the other, to a certain extent. The saw is then removed, the skin incision closed by sutures, and the bone is then broken by manual force.

Osteotomy is either linear or cuneiform, that is to say a wedge-shaped piece is excised from the bone; in the linear form the bone is chiseled directly through. McEwen's opera-

tion may be considered as an intermediary. In the operation devised by the noted surgeon of Glasgow, a set of different-sized wedge-formed chisels are used.

Osteotomy may be either partial or total. In the first instance a small amount of bone tissue is left uniting the fragments, while in total osteotomy the bone is chiseled completely through. The principles of Langenbeck's sub-cutaneous osteotomy are now universally adopted for linear osteotomy, but this method cannot be applied in the case of cuneiform section of the bone, where we must use the mallet and the chisel instead of the chain saw. All types of osteotomy may have to be combined in certain instances, according to the deformity present in a given case.

As to conditions necessitating osteotomy, we have angular deformities of the limbs, badly united fractures, ankyloses of various varieties, and contractures of the joints. Genu valgum and pes valgus and varus are usually, if not always, due to rachitic changes in the osseous system.

Genu valgum, which is one of the most frequent manifestations of rachitis, develops partly during the first years of life, and partly during or after the age of puberty, especially in subjects whose work obliges them to be much of the time on their feet, either standing or walking.

This fact has been explained by some, by the hypothesis of a tardy rachitis; in other words it is to be admitted that rachitis can attack the bones, not only during childhood, but after the age of puberty has passed.

The adversaries of this theory suggest an over amount of weight being placed upon the knee joint, as the etiological factor of genu valgum in adolescents, and deny the possibility of rachitis in young adults.

Now, in point of fact, the occurrence of tardy rachitis has, as yet, not been proven scientifically, but what is very evident is that genu valgum does frequently occur in the class of patients above mentioned, and it is of daily observation to meet with young patients who are working all day standing up, whose bones are not sufficiently hard to bear their burden, and where the exact pathologic change is as yet not clearly defined which can account for the soft condition of the bone. We cannot make a definite distinction between a genu valgum due

rachitis, and the static variety of the affection as has been attempted by many authorities.

The rachitic type of genu valgum is also a static one, inasmuch as the inward curve of the bones in little rachitic children will only occur in consequence of the pressure of the weight of the body; and again in those cases where the over use of the limbs is the supposed etiological factor, it is naturally assumed that there is an abnormal lack of resistance in in the bone substance, and it is a question whether or not it is due to a true rachitic process.

Genu valgum may be produced from the fact that the internal condyl of the rachitic femur undergoes hypertrophy, while the external condyl becomes atrophied. From this condition, the angle formed by the femur and the tibia, which is open outwardly and under normal conditions is about 170°, will be decreased several degrees on account of the greater abduction of the tibia, which is due to the hypertrophy of the internal condyle. An inward bending of the tibia may also produce a genu valgum, and often both conditions will be met with in the same patient, and this was well illustrated in the case just shown you. It might also be assumed that a genu valgum could be produced by an inward direction of the tibia and fibula, similar to the condition known as genu varum, which may be due to both an outward curve of the femur or tibia. And lastly, as I have shown you in our patient, an hypertrophy of the internal condyl of the tibia may cause a genu valgum.

Such conditions will be readily understood if we make the following considerations: When a rachitic child makes its first attempt at walking, the weight of the body will produce an inward bending of the femur, if this particular bone is the one exclusively attacked by the pathological process, or at least more so than the others. The bending would naturally occur near to the point of support, consequently in this case it would be in the neighborhood of the knee joint. The irritation produced by the pressure exercised on the internal condyle would explain the hypertrophy.

Now, if the tibia and not the femur is the principal site of rachitic lesions, the weight of the body will, in this case, produce a combination of deformities, and if the disease is more manifest in the lower third of the tibia, we will then have a

pes valgus as well. It is of the utmost importance that you should be acquainted with these various conditions, because the treatment can then be rationally carried out. Consequently, the operative treatment of genu valgum will be an osteotomy of either the femur, tibia or fibula, according to the conditions presented in a given case. In 1894 I published the case of a little girl of ten years on whom an osteotomy of the tibia and fibula in both legs in their lower third, and an osteotomy of the femur on the right was done for rachitic deformity, so you see how complicated cases may be.

The operations devised for the correction of genu valgum are very numerous indeed, some cases requiring an osteotomy of the femur alone, while others demand an osteotomy of the tibia for their cure. Ogston's osteotomy of the femur is not any longer performed, and was simply a linear section through the internal condyl of the femur. The knee joint was first opened, and then a chain saw was introduced at the inner edge of the femur, and the internal condyle was sawn off; after this had been done, the shape of the limb was corrected.

When the condyle was cut through, it would slip upwards and would unite with the bone at a point higher up. The principal danger in this operation is the opening of the joint, which often will give rise to disturbances in the process of repair, for even if asepsis is perfect, the opening into the joint is frequently followed by suppuration, a fact that may be explained by the anatomical structure of a joint. A joint is lined with synovial membrane, which is serous in nature, and like all serous membranes, it is more prone to infection than any other tissues of the body, and if there are any pyogenic bacteria in the general circulation, and it is a well-known fact that they are sometimes accidentally present in the blood, they will accumulate in the joint, and grow in the excellent culture soil offered them after an osteotomy, namely, an effusion of blood.

Another danger in Ogston's osteotomy is due to the presence of small particles of bone chipped off during section, which may accumulate in the joint, and set up inflammatory phenomena and ankylosis, or arthirtis may result. It is certain that Ogston's operation has achieved many successful results, with excellent functional use of the limb, and a cosmetic result far beyond any other method, but for all that, I prefer other methods for the reasons already stated.

Condylotomy, which was devised by Swan, is a modification of Ogston's osteotomy. An incision is made over the inner aspect of the femur, and a special kind of chisel is introduced, the proper oblique direction being given the instrument. No mallet is used. The operator seizes the handle of the chisel firmly, and pressing the instrument against the bone in the required direction, sawing motion is made, and the condyl is cut, and finally completely detached, by using the chisel as a lever. The limb is then forcibly corrected.

Annandale and Chiene's operations must also be recalled. The first-named is an osteotomy of both condyles, while the second is a cuneiform osteotomy of only one condyle. But all these technics have the same objection as Ogston's operation, namely, the opening of the knee joint.

Macewen was the first to devise an operation in which opening and resection of the joint were avoided, and he performed his first extra-articular cuneiform osteotomy of the femur in 1872. The operation is done as follows: An incision about five centimeters long is made about four fingers' breadth above in the articular line on the inner aspect, and the knife is brought directly down on the bone through the muscle. The large vessels are out of the way, and any injury to them need not be feared. A chisel is then introduced into the wound along the blade of the knife, using the latter as a director, and a wedge-shaped piece of bone is excised. The incision is then closed and a drain inserted, and the limb is put up in plaster in a corrected position.

Later on Macewen advised a linear instead of a cuneiform osteotomy, and obtained just as good results, and in fact, when a wedge-shaped piece is excised from the bone, the space left is immediately filled by blood, which would become organized and be included in the formation of the callus.

Now, there is just one point on which I would insist, and that is stripping off the periosteum before making the cuneiform excision. It is fairly easy to do this if you use a periosteum elevator, such as I show you here. The blade is narrow and forms with its long handle an angle of about 160°. By carrying the incision through the muscle and periosteum you can easily insert the elevator and strip off the bone covering sufficiently for the chisel to be passed between the periosteal flaps.

The operation of osteotomy is applied to genu valgum, whether produced by an hypertrophy of the internal condyl or to a curve at the lower third of the femur. If now the course of knock-knee is due to a similar pathologic condition of the bones of the leg a subcutaneous incomplete osteotomy of the tibia and fibula may be done or an incomplete cuneiform osteotomy of the tibia alone can be performed. Cuneiform osteotomy of the tibia and linear osteotomy of the fibula is recommended by Schede.

Now, if it be recalled that genu varum is also produced by a pathologic curving of the femur, there being an hypertrophy of the external condyle of the tibia, it will readily be seen that osteotomy is indicated for the correction of this deformity as well. The tibia is the bone usually at fault in genu varum, and in most instances a wedge-shaped or linear osteotomy of this bone will be quite enough to correct this condition.

Pes valgus, varus, or varo-equinus also require osteotomy for their cure. When correcting these deformities the point is to give the foot a normal position, which is accomplished by wedge-shaped excisions or extirpation of certain bones of the foot or the malleoli.

The bones mostly concerned are the talus, calcaneum, os cuboideum and naviculare, the internal malleolus of the tibia and external malleolus of the fibula. In flat-foot, for example a wedge-shaped excision comprising the head of the talus, the anterior articular surface of the calcaneum, a large portion of the os cuboideum and a smaller amount of os naviculare is sometimes indicated.

After this excision the correction of the foot from plantar flexion, adduction, and supination into a nearly normal position can be obtained. In other cases a simple extirpation of the talus is enough, while if, for example, you are dealing with a badly united fracture of the malleolus, which has produced a traumatic pes varus, a wedge shaped osteotomy of the external malleolus and dislocated talus will produce the desired rectification of the deformity. Some cases of varo-equinus are best treated by extirpation of the talus.

Tarseotomy in infantile paralysis is sometimes indicated where the tensor muscles are so weakened that a total inversion of the foot results, but as each case requires separate consideration I cannot enter into the discussion of this subject today.

Another condition to be mentioned is hallux valgus, a deformity that is usually produced by improperly fitted footwear. The toes are pressed over one another and tightly together, and the integuments being easily excoriated, infection takes place, often resulting in abscess formation. The head of the first metatarsal bone will usually be found greatly hypertrophied, and if by suitable shoes the deformity cannot be corrected we must resort to the excision of the hypertrophied part of the bone.

Badly united fractures that require osteotomy are not so often met with as rachitic conditions of the bones. In fractures where union has taken place with the fragments in bad approximation, it is not so much the deformity as it is the shortening of the limb that calls for operation. The femur is the bone most frequently calling for osteotomy, while a vic-

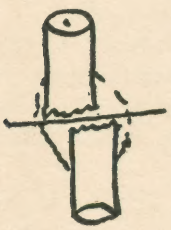

FIG. I.

FIG. II.

FIG. III.

FIG. IV.

iously united fracture of the arm would not necessitate an operation, and a shortening of the humerus of as much as six or seven centimetres will not inconvenience the patient sufficiently to justify osteotomy, while if it were the femur this amount of shortening would practically incapacitate the patient.

Practically we have four types of vicious healing after fracture, as follows:

1.—Lateral union of the fractured ends.

2.—Longitudinal displacement.

3.—Angular displacement.

4.—Peripheral dislocation where the displacement is produced by the rotation of one or both fragments. (See Figs. 1, 2, 3, and 4).

Longitudinal and angular displacements are the only ones that would produce a shortening of the limb, while in lateral

union and peripherial dislocation the length of the femur will remain practically the same as before fracture.

In longitudinal displacement an oblique section of the callus is all that is required, while in angular displacement a wedge-shaped osteotomy should be performed, the size of the excised portion of bone varying with the degree of shortening present, which, in itself, is in direct relation to the amount of the angle formed by the fragments. Linear osteotomy may occasionally be indicated in lateral union or displacements by rotation of the fragments.

One point more and I shall have finished. Inexperienced operators are most likely to be at loss as to how much bone should be cut out in the wedge in order to produce just enough correction of the limb. The solution of the problem is easy;

FIG. V.

1. Incision carried perpendicularly through the long axis of femur.
2. Incision carried perpendicularly through the long axis of tibia.

all that you remember is to cut down on each bone with your chisel *perpendicularly* to the bone. For example, in osteotomy of the knee (see Fig. 5). The femur is first cut through at right angles with its long axis and then the tibia is likewise treated. You see that although a seemingly large amount of bone is thus removed, still, by following out the rule above given, you will not have taken out too much or too little for the proper correction of the deformity.

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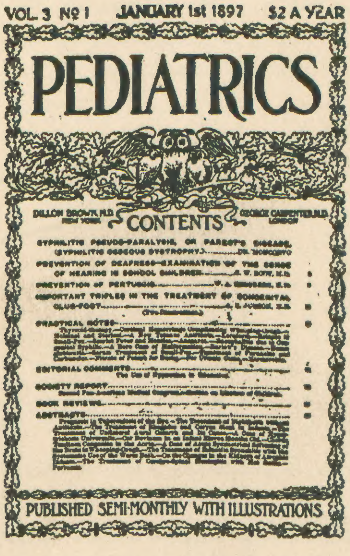

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